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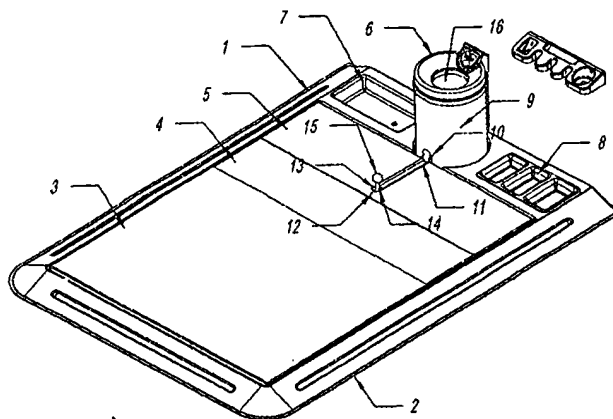
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[Continued on next page]

(54) Title: MECHANICAL HANDLING DEVICE FOR GOLF BALLS AT A DRIVING RANGE



(revised)

(57) Abstract: A mechanical handling device (6) for golf balls (5) at a driving range, comprising a pivotally mounted balance or lever arm (24) provided at one end with a tee (14) adapted, in use, to receive and support a golf ball (15) from a supply source, and provided at its other end with a weight sensitive transducer (26) whereby, from a neutral start position (Figure 3), the arm (24)/tee (14) is initially pivoted downwardly under the influence of the weight of a ball (15) arriving at the tee (14), such initial movement being sensed by the transducer (26) to activate control means causing the arm (24)/tee (14) to be pivoted to an elevated, striking position (Figure 4), and loss of ball weight at the tee (14), after striking of the ball, also being sensed by the transducer (26) to activate control means to cause the arm (24)/tee (14) to be pivotally returned to its neutral position. The invention also includes a driving range tee (1) provided with a device (6).



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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Title of the Invention**

“Mechanical handling device for golf balls at a driving range”

**Field of the Invention**

This invention relates to a mechanical handling device for golf balls and in particular, to a device for the placing of a golf ball on a tee at a driving range.

**Background of the Invention**

Various devices have been proposed for the removal of an individual golf ball from a reservoir of golf balls and the transportation of individual balls to a tee, c.f. US 4796893 and US 5259622, most of which devices have required activation by the golfer. In other more rudimentary systems, the golfer brings a basket of balls and places them individually on the tee. All such proposals have required movement of the golfer from the position and stance adopted for the previous ball, which unavoidable movement is not always desirable or beneficial if the golfer is seeking to improve a golf swing etc.

**Object of the Invention**

A basic object of the invention is the provision of an improved mechanical handling device for golf balls at a driving range.

**Summary of a First Aspect of the Invention**

According to a first aspect of the invention there is provided a mechanical handling device for golf balls at a driving range, comprising a pivotally mounted balance or lever arm provided at one end with a tee adapted, in use, to receive and support a golf ball from a supply

source, and provided at its other end with a weight sensitive transducer whereby, from a neutral start position, the tee is initially pivoted downwardly under the influence of the weight of a ball arriving at the tee, such initial movement being sensed by the transducer to activate control means causing the tee to be pivoted to an elevated, striking position, and loss of ball weight at the tee after striking of the ball also being sensed by the transducer to activate control means to cause the tee to be pivotally returned to its neutral position.

### Summary of a Second Aspect of the Invention

According to a second aspect of the invention there is provided a driving range tee incorporating a mechanical handling device for golf balls, in accordance with the first aspect.

### Advantages of the Invention

Although a typical golf ball is of relatively light weight, the lever arm serves to multiply the weight of a ball, when supported on the tee, to provide reliable sensing of the presence, or absence of a ball on the tee, and hence the activation mode required of the control means.

### Preferred or Optional Features

The tee comprises a tubular member.

The tubular member is of rubber or synthetic plastics material.

The tubular member is provided with a flared mouth on which a portion of the periphery of a golf ball is adapted to seat so as to be supported.

Means are provided for automatically delivering individual balls to the tee, so that it is not necessary for the golfer to bend over to manually place a ball on the tee, so that the golfer does not lose stance or grip between shots thereby allowing small changes to be made in order

to try improvements, whilst furthermore, the sequence of operation can be such that the next ball ~~is being feed up~~ whilst the current ball is being observed, resulting in less time being taken to drive a quantity of balls and, therefore, increasing the capacity of the driving range.

The ball delivery means delivers individual balls dynamically by a rolling action to the tee, and a stop means for the balls is provided in the vicinity of the tee.

The stop means is provided by one end of a linear groove, or depression, in a mat associated with the device.

The mat is provided with a through hole through which the tee is adapted to pass in accordance with the movement of the balance or lever arm and the tee, effected by the control means.

The transducer comprises an optical sensor and a calibrated spring.

The transducer comprises at least one micro-switch.

The automatic delivery means is disposed at an elevated location with respect to the tee, adapted to house a plurality of golf balls, and to separate, and dispense individual golf balls under control of the control means, from a discharge orifice.

The automatic delivery means comprises a ball platform located beneath a reservoir and a power driven rotary ball indexing plate provided with a plurality of circular holes of diameter greater than a golf ball, with the plate being indexed to a position in which an aperture finds itself above an inlet end of the chute, with sensor means to control release of a ball.

The sensor means is a spring.

The sensor means is an opto-electric sensor.

The automatic delivery means comprises a cam track.

The control means comprises an optical encoder.

The control means comprises a printed circuit board.

Rotation of the indexing plate is by a DC or a pneumatic motor.

The reservoir is of capacity to contain eg ~~<100~~ golf balls.

The reservoir also houses, above the carousel, a shelf with a segment removed to form an escapement to control the entry of the balls into and out of the carousel pockets.

A motor drives a gearbox with the vertically mounted output shaft coupled to a ball carousel with multiple eg 8 ball pockets mounted inside the hopper.

A chute or similar device, has an inlet end located adjacent the discharge orifice of the delivery means and a lower delivery end, whereby a rolling ball exits from the delivery end.

The chute is arcuate, or generally so, so that its upper, inlet end may receive a golf ball in a vertical direction, and its discharge end may discharge a ball in a horizontal direction eg into the linear groove of a mat.

The chute comprises four parallel wire elements of suitable curvature. It follows that the extent of elevation of the automatic delivery means with respect to the tee must be such as to give a sufficient, but not excessive, rolling impetus to a ball such that the ball reaches the stop but does not have a momentum to pass beyond the stop.

As an alternative to a grooved mat, there may be provided a pair of flaps hinged on parallel axis, with, in the elevated position ends of the parallel edges of the flaps located adjacent the discharge end of the chute, with the flap edges serving as a rolling ball guide track.

The flaps are hingeable by a meshing finger arrangement, geared together.

In the alternative arrangement, the stop means is constituted by a stop surface provided on one or both flaps or fingers.

The motor for the indexing plate also drives any flaps or fingers between their upper ball conveying position and their lower position via lever arms and torsion rods.

A base of the machine provides a mount for the flaps or fingers which are hinged about parallel, horizontal axes.

The upper surfaces of the flaps or fingers are covered with a synthetic plastics simulating turf.

The flaps or fingers are spring loaded upwardly by a crank mounted on a horizontal input shaft.

The flaps or fingers are rotatable against the spring bias by a linkage.

The device has a start switch which, when actuated, causes the carousel to rotate 1/8 of a revolution to drop one ball down the wire chute whilst at the same time.

In the flap or finger embodiment detection means is provided to detect the ball in position over the tee eg by slight movement of the tee actuating an electrical switch. Alternatively, an electrical switch is mounted on one of the flaps or fingers which will allow the device to place balls on shorter tees or no tee at all. When the ball is detected over the tee, the motor starts to rotate again, causing the flaps or fingers to close which results in the ball being left upon the tee. When the flaps or fingers have fully closed the motor stops and the machine waits for the ball to leave the tee. As soon as the ball leaves the tee, the tee arm lifts and the cycle is repeated automatically.

The invention will now be described in greater detail, by way of examples, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a driving range tee incorporating first embodiment of mechanical handling device in accordance with the invention;

Figure 2 is an enlargement of the mechanical handling device of Figure 1;

Figure 3 is a section through Figure 2 with the balance or lever arm in a neutral position;

Figure 4 corresponds to Figure 3 but shows arm in an upper position;

Figure 5 is a perspective view from one side and above of the automatic delivery means of Figures 1-4;

Figure 6 corresponds to Figure 5 but is from the other side, and below;

Figure 7 is an axial sectional view through the automatic delivery means, and

Figures 8 and 9 correspond to Figure 5, but show a second embodiment of mechanical handling device, in two positions.

In both embodiments, like components are accorded like reference numerals.

In Figure 1, a driving range tee 1 is defined by a rectangular tray 2 housing a standing mat 3, a driving mat 4 and a tee mat 5. Adjacent the tee mat 5 is a first embodiment of mechanical handling device 6 with, to each side of the device 6, storage areas 7 and 8.

The device 6 projects upwardly from the tee 1 to an elevated location and comprises a cylindrical outer casing 9 having a ball discharge orifice 10 at one end of a groove 11 in the tee mat 5, the other end of the groove 11 constituting a stop 12, where a circular aperture 13 is provided, through which a tubular tee 14 is movable, and adapted to support at its upper end a golf ball 15.

The device 6 has an inlet aperture 16 through which a plurality of balls 15 may be poured from a bucket or other container, into a hopper 16 beneath which, and co-axial with the outer casing 9, is an indexing plate 17 provided with a plurality of apertures 18 through which a golf ball 15 may pass. When an aperture 18 is above an upper inlet end 19 of a chute 20 constructed from four parallel wires 21, a ball may enter the chute and as due to the curvature of the chute,



be given a rolling movement sufficient, upon exiting a discharge end 22 of the chute 20, to roll along the groove 11 until striking the stop 12 at which point the ball drops onto the upper end of the tubular tee 14.

The tubular tee 14 is supported on one end 23 of a lever or balance arm 24 of the device 6, the arm being pivotably mounted on a pin 25, while a transducer 26 comprising an optical sensor 27 and a calibrated spring 28, is associated with the other end 29 of the arm 24.

Figure 3 shows a 'neutral' position of the arm 24, in which position the tubular tee 14 is about to receive a ball. Upon a ball engaging the tubular tee 14, the arrangement is such that the increase in weight causes the balance arm to fall (ie to rotate a few degrees clockwise) this rotation is sensed by the transducer 26, which through industry-standard control means (not shown) causes the arm 24 to be rotated anticlockwise so as to elevate the ball 15, and the tubular tee 14, to the position indicated in Figure 4.

When a ball 15 has been struck, the loss of weight at the end 23 of the arm 24 is again sensed by the transducer 26, to cause the arm 24 to be rotated a few degrees anticlockwise, to lower the tubular tee 14, from the 'striking' position of Figure 4, to the striking 'neutral' position of Figure 3, ready to receive the next ball.

In the second embodiment of Figures 8 and 9, the groove 11 of the first embodiment, is replaced by a pair of edges 27 of flaps 28 provided with a ball stop 12, the flaps being pivotably mounted on a tray 30 and displaceable between the elevated, ball receiver and conveying position of Figure 8, and the striking position of Figure 9, again with rolling momentum being provided by the chute 20. Also in this embodiment, a static plate having a ball escapement aperture 31 is located beneath the indexing plate 17.

**CLAIMS**

1. A mechanical handling device for golf balls at a driving range, comprising a pivotally mounted balance or lever arm provided at one end with a tee adapted, in use, to receive and support a golf ball from a supply source, and provided at its other end with a weight sensitive transducer whereby, from a neutral start position, the tee is initially pivoted downwardly under the influence of the weight of a ball arriving at the tee, such initial movement being sensed by the transducer to activate control means causing the tee to be pivoted to an elevated, striking position, and loss of ball weight at the tee after striking of the ball also being sensed by the transducer to activate control means to cause the tee to be pivotally returned to its neutral position.
2. A device as claimed in Claim 1, wherein the tee comprises a tubular member.
3. A device as claimed in Claim 2, wherein the tubular member is of rubber or synthetic plastics material.
4. A device as claimed in Claim 1 or Claim 2, wherein the tubular member is provided with a flared mouth on which a portion of the periphery of a golf ball is adapted to seat so as to be supported.
5. A device as claimed in any preceding claim, wherein means are provided for automatically delivering individual balls to the tee.

6. A device as claimed in Claim 5, wherein the ball delivery means delivers individual balls dynamically by a rolling action to the tee, and a stop means for the balls is provided in the vicinity of the tee.
7. A device as claimed in Claim 6, wherein the stop means is provided by one end of a linear groove, or depression, in a mat associated with the device.
8. A device as claimed in Claim 7, wherein the mat is provided with a through hole through which the tee is adapted to pass in accordance with the movement of the balance or lever arm and the tee, effected by the control means.
9. A device as claimed in any preceding claim, wherein the transducer comprises an optical sensor and a calibrated spring.
10. A device as claimed in any one of Claims 1 to 8, wherein the transducer comprises at least one micro-switch.
11. A device as claimed in Claim 5, and any claim appendant thereto, wherein the automatic delivery means is disposed at an elevated location with respect to the tee, adapted to house a plurality of golf balls, and to separate, and dispense individual golf balls under control of the control means, from a discharge orifice.
12. A device as claimed in Claim 5, and any claim appendant thereto, wherein the automatic

delivery means comprises a ball platform located beneath a reservoir and a power driven rotary ball indexing plate provided with a plurality of circular holes of diameter greater than a golf ball.

13. A device as claimed in Claim 5, and any claim appendant thereto, wherein a chute or similar device, has an inlet end located adjacent the discharge orifice of the delivery means and a lower delivery end, whereby a rolling ball exits from the delivery end.
14. A device as claimed in Claim 13, wherein the chute is arcuate, or generally so, so that its upper, inlet end may receive a golf ball in a vertical direction, and its discharge end may discharge a ball in a horizontal direction.
15. A device as claimed in Claim 13 or Claim 14, wherein the chute comprises four parallel wire elements of suitable curvature.
16. A device as claimed in any one of Claims 1 to 5, comprising a pair of flaps hinged on parallel axis, with, in the elevated position ends of the parallel edges of the flaps located adjacent the discharge end of the chute, with the flap edges serving as a rolling ball guide track.
17. A device as claimed in Claim 16, wherein the flaps are hingeable by a meshing finger arrangement, geared together.

18. A device as claimed in Claim 16 or Claim 17, wherein upper surfaces of the flaps or fingers are covered with a synthetic plastics simulating turf.
19. A device as claimed in any one of Claims 16 to 18, wherein the flaps or fingers are spring loaded upwardly by a crank mounted on a horizontal input shaft.
20. A driving range tee provided with a mechanical handling device, as claimed in any preceding claim.

Figure 1.

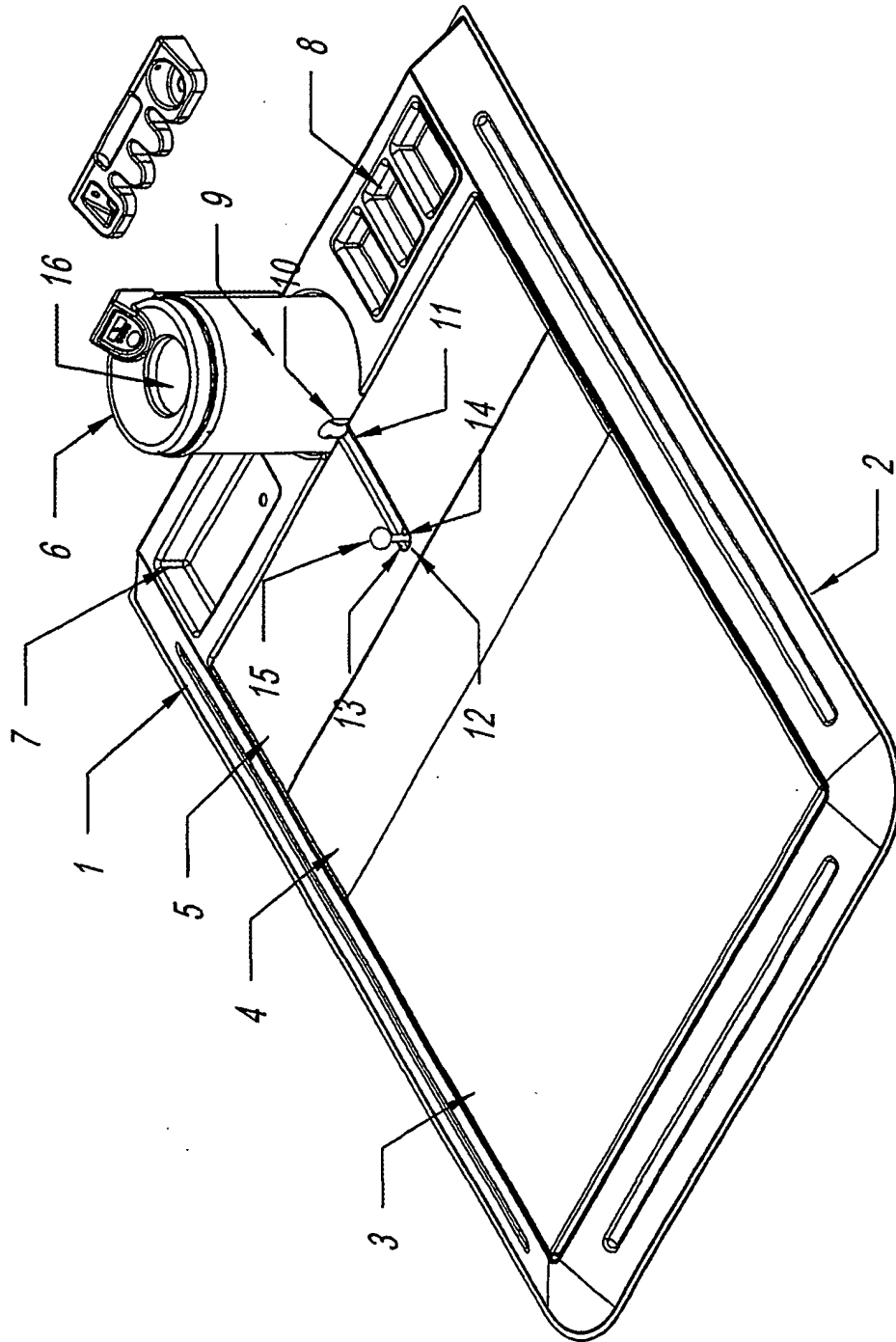
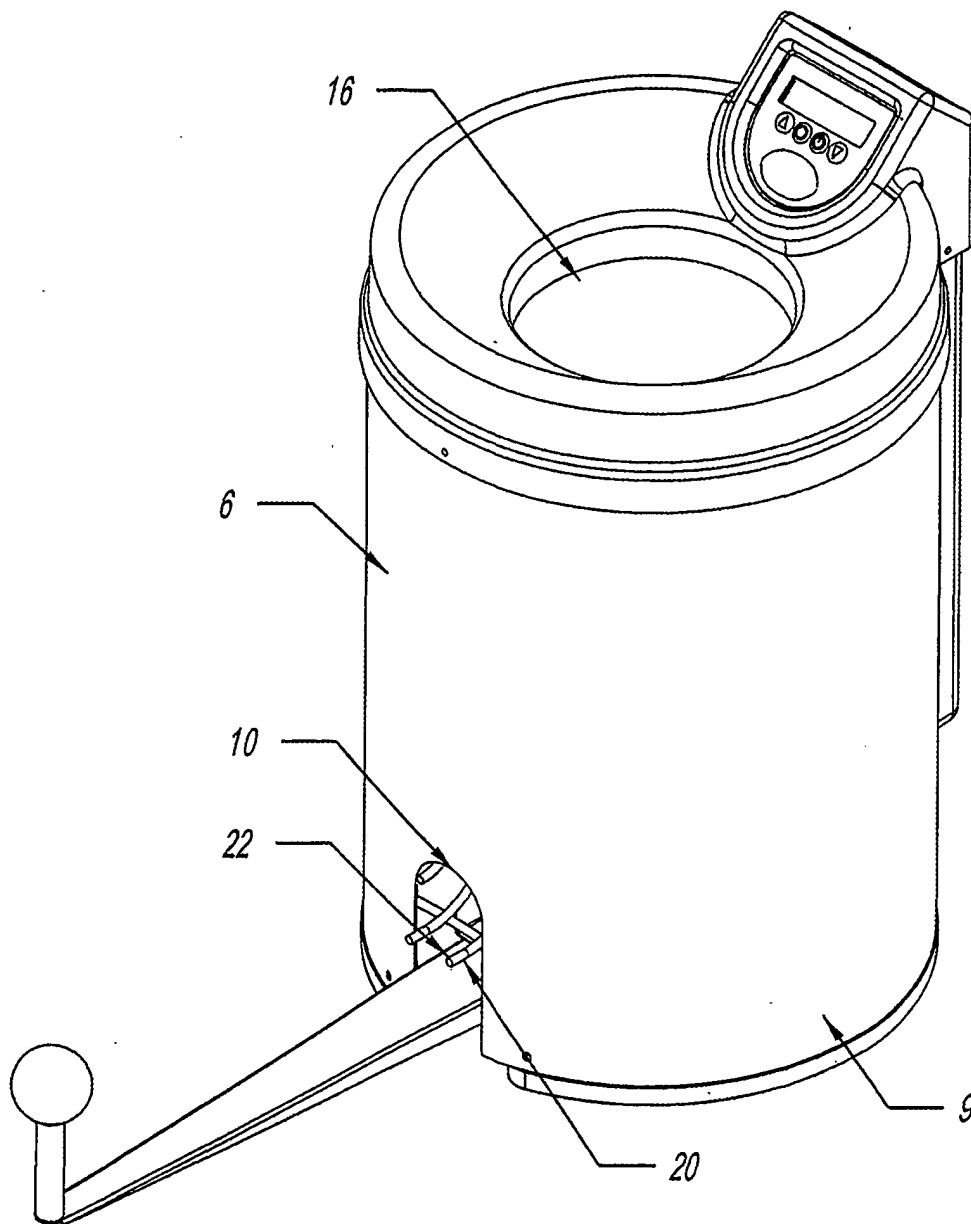


Figure 2.



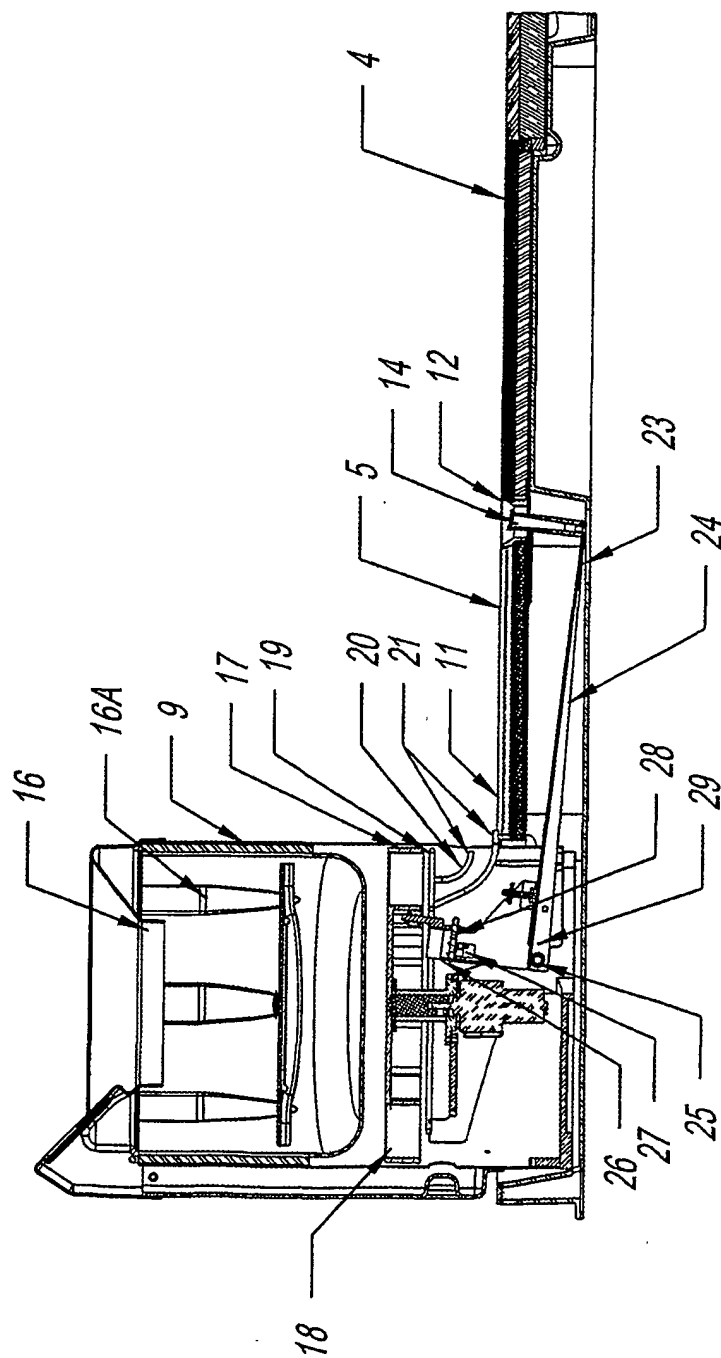


Figure 3.



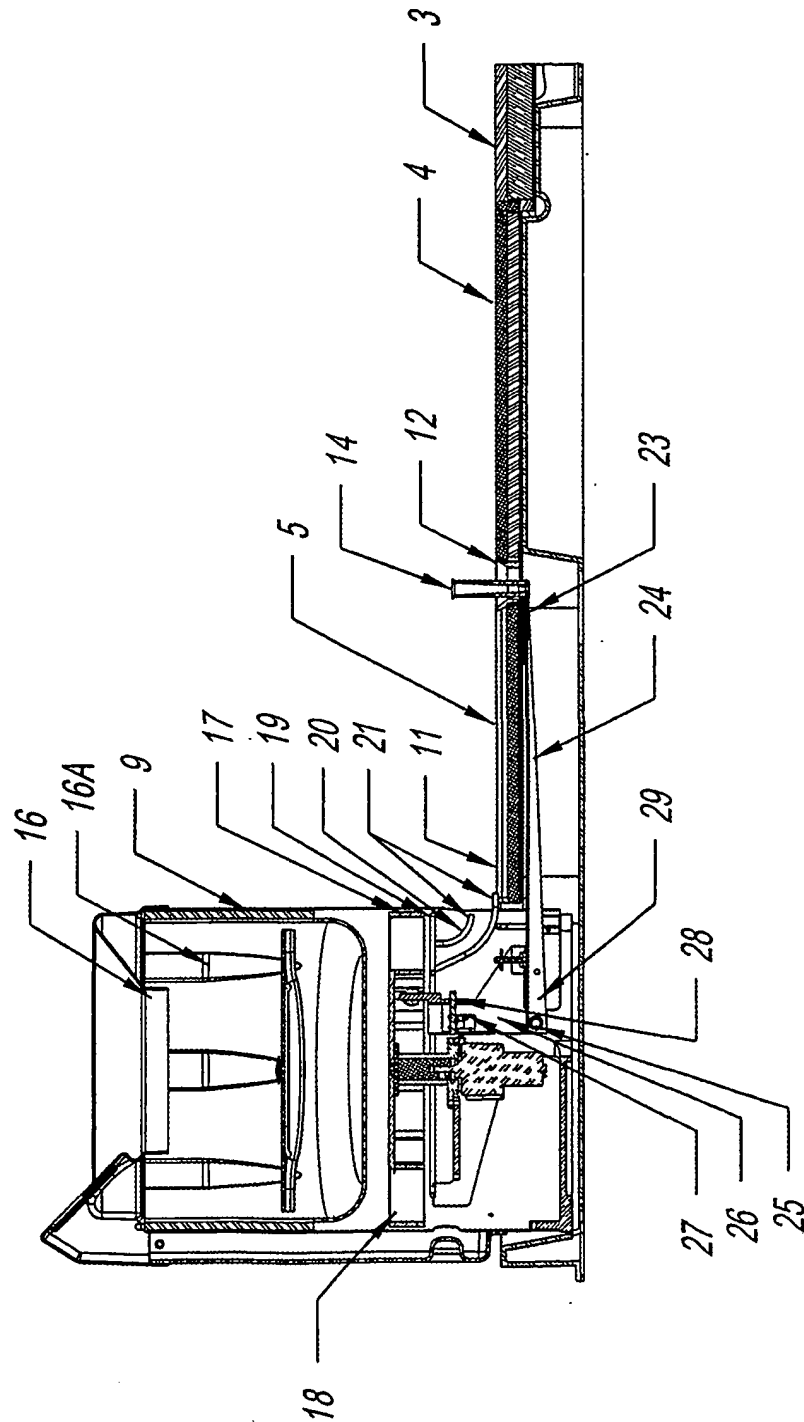
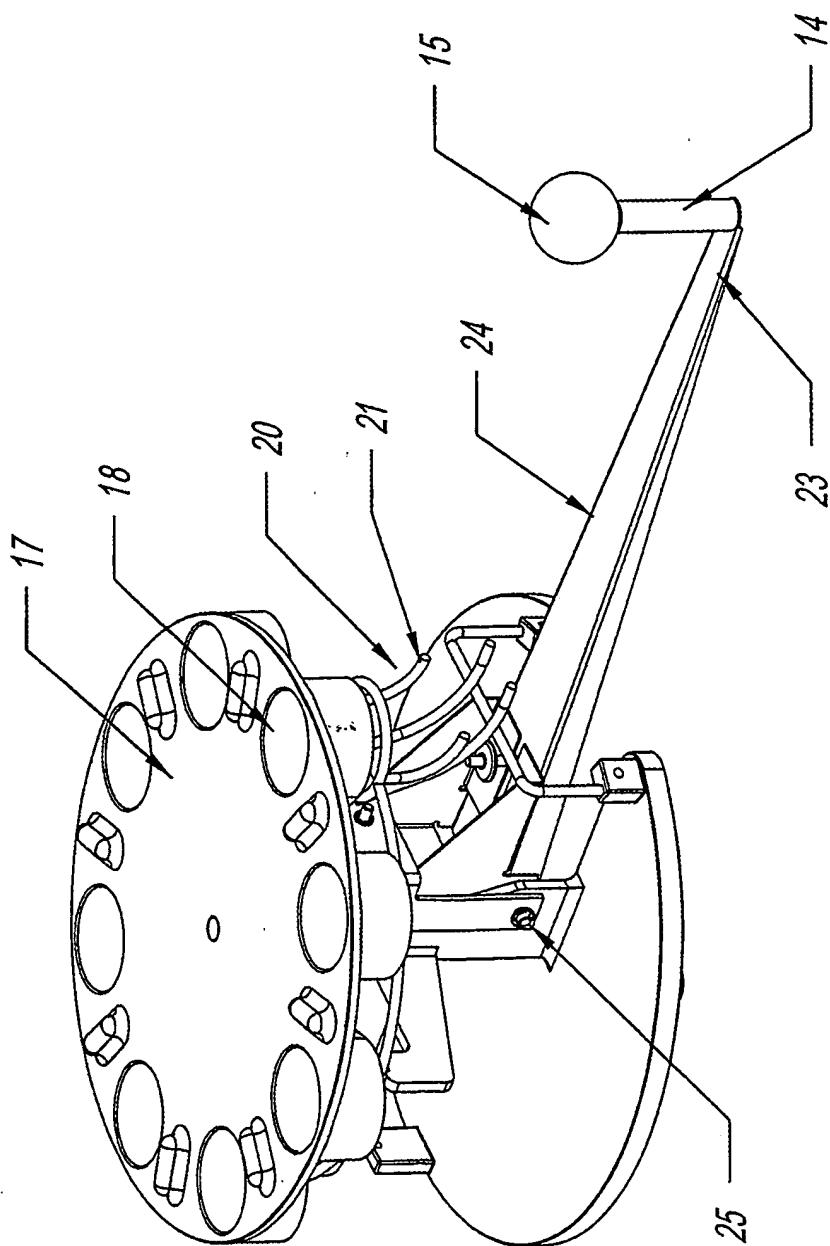


Figure 4.

Figure 5.



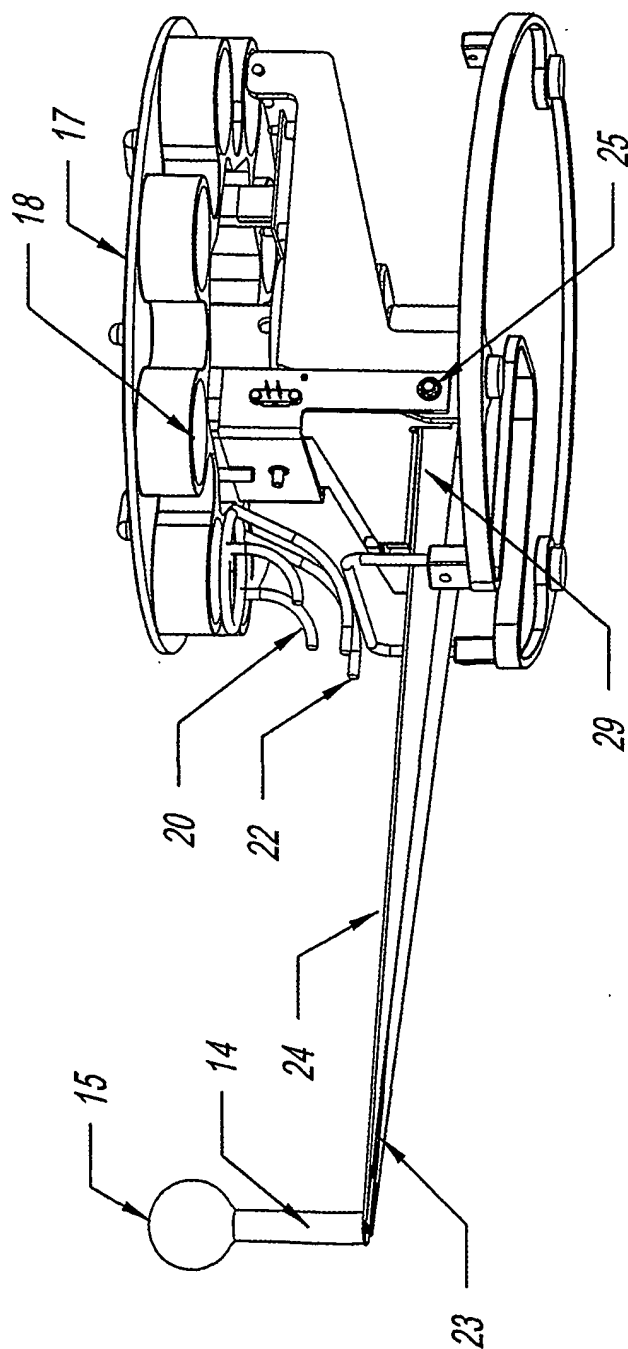
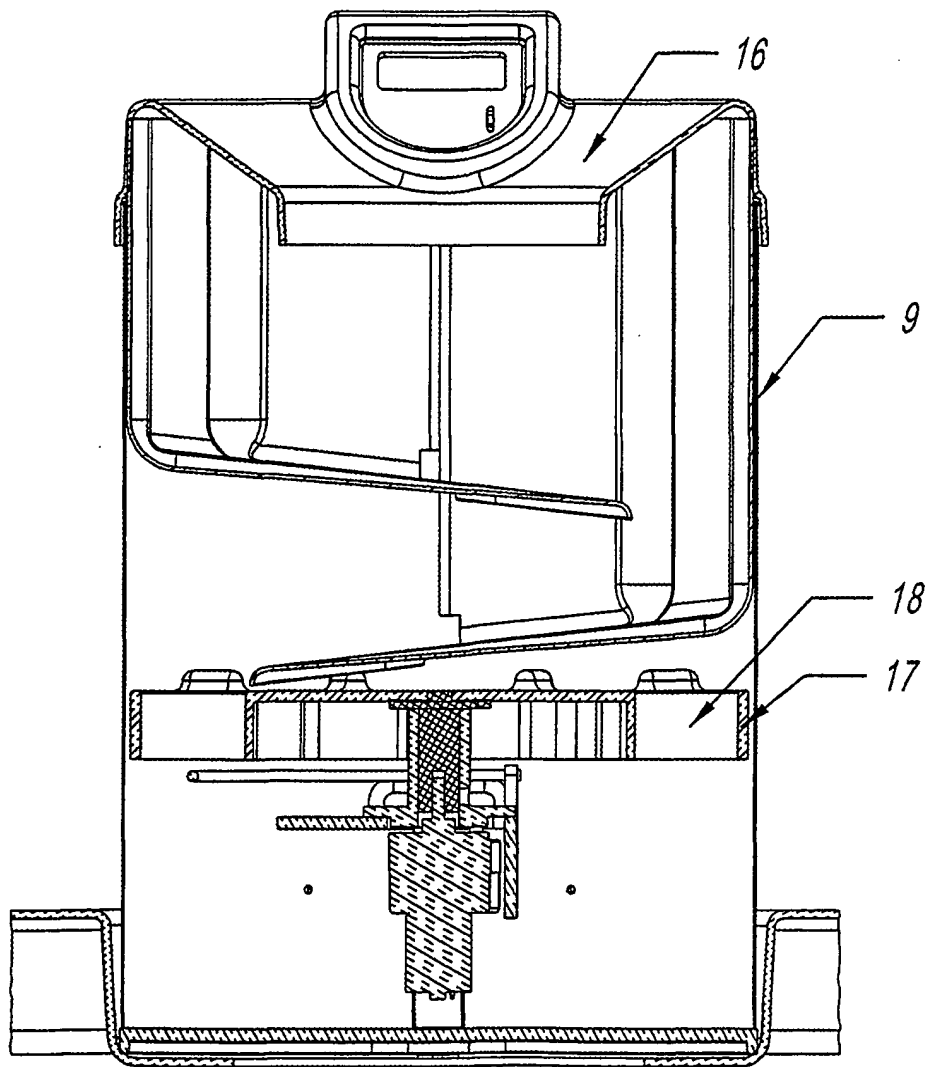


Figure 6.

Figure 7.



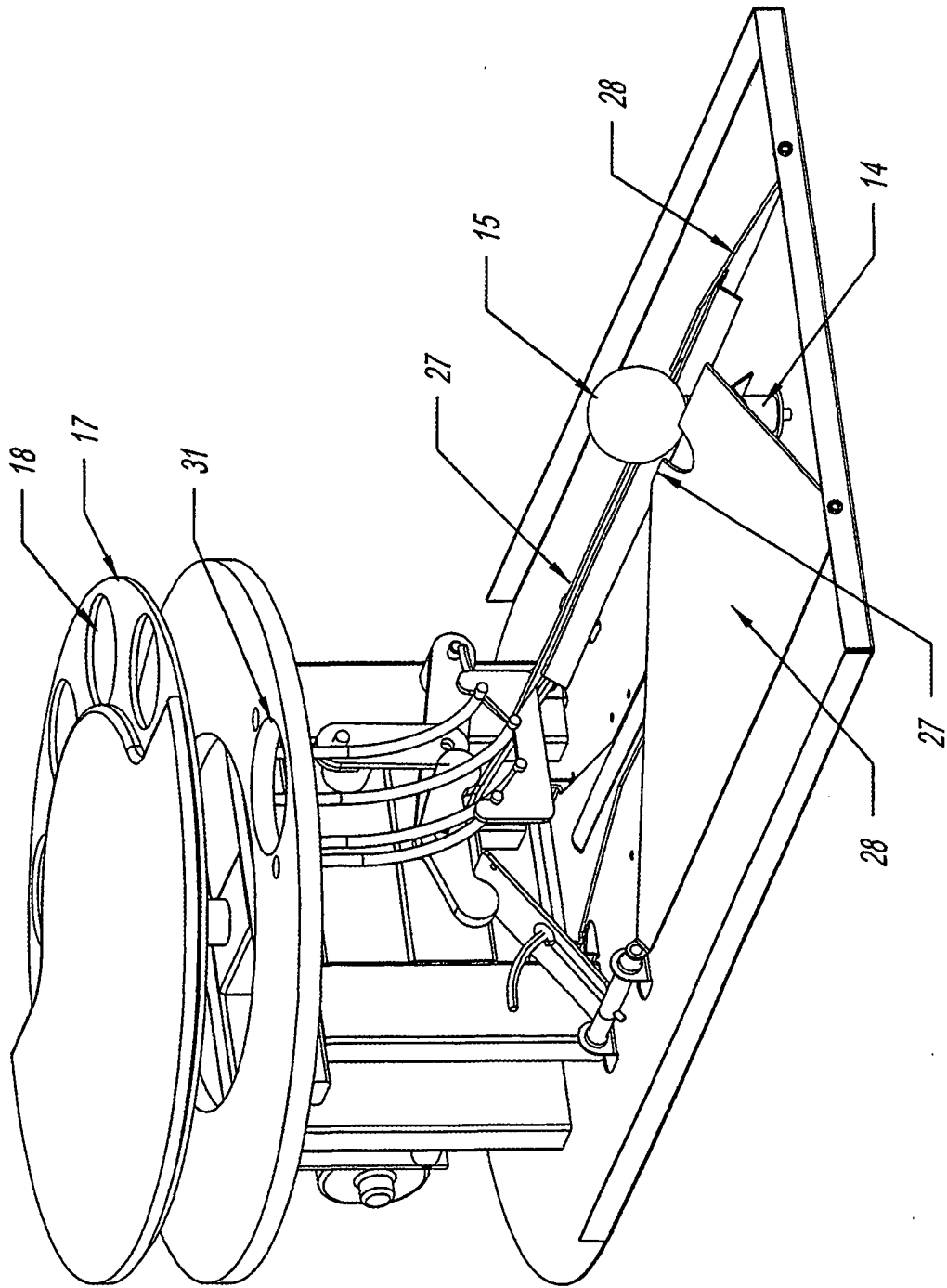
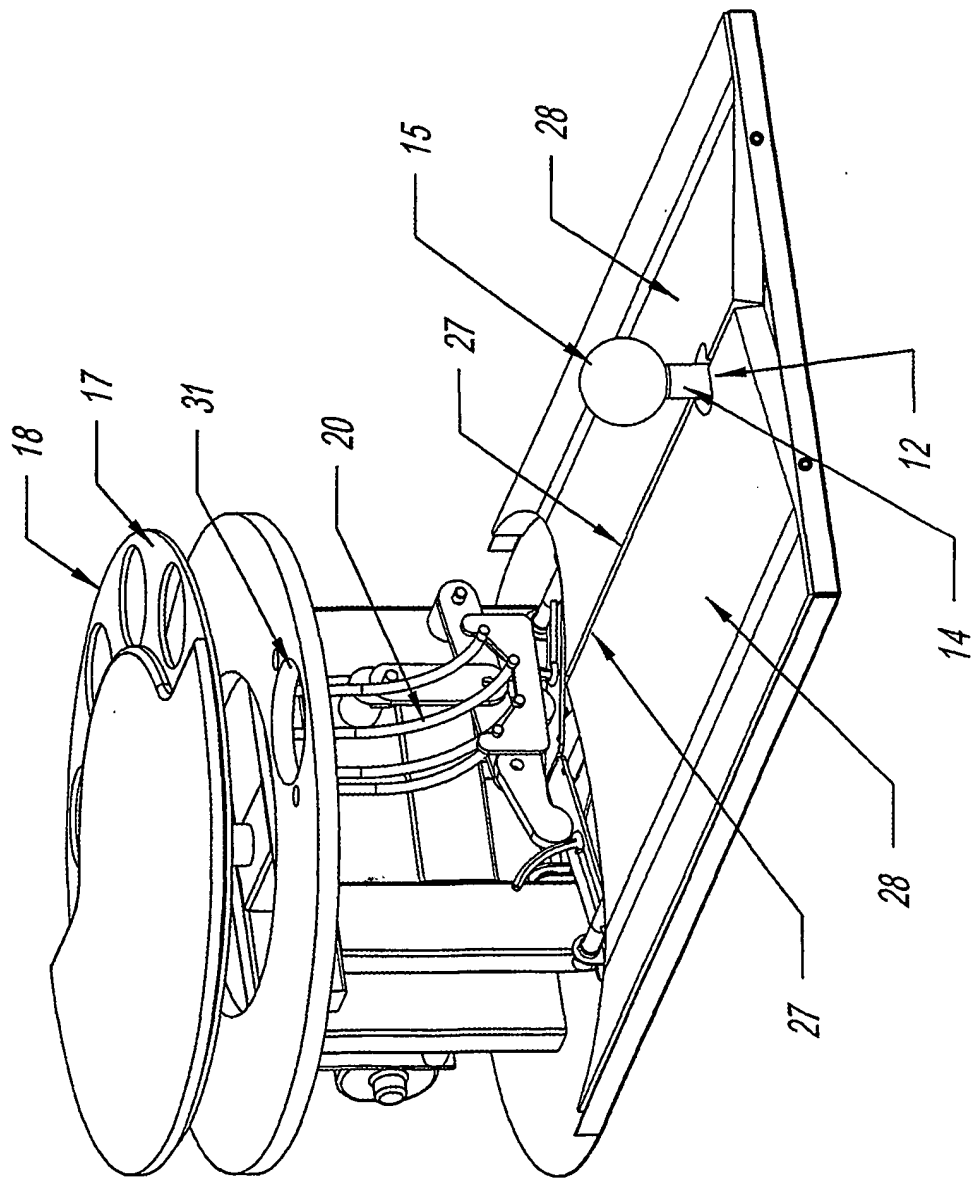


Figure 8.

Figure 9.



## INTERNATIONAL SEARCH REPORT

In International Application No.

PC1/GB 02/00788

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A63B57/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| X          | US 3 901 515 A (MOZEL JOE)<br>26 August 1975 (1975-08-26)<br>column 3, line 24 - line 38<br>column 4, line 20 - line 44<br>column 4, line 53 - line 55<br>column 5, line 33 - line 47<br>figures 2,9,10 | 1-3,5,<br>10,11,20    |
| Y<br>A     | -----   | 12<br>6,13,16         |
| Y          | US 3 142 488 A (PORTTEUS JAMES G)<br>28 July 1964 (1964-07-28)<br>column 5, line 68 - line 71<br>column 6, line 12 - line 15<br>column 6, line 26 - line 30<br>figures 4,5<br>-----<br>-/--             | 12                    |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents:

\*A\* document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search

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23/07/2002

Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 02/00788

| C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT |  |                       |
|--|--|-----------------------|
| Category *   | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
| A  | US 2 127 282 A (BECKETT CLAY C)<br>16 August 1938 (1938-08-16)<br>page 2, left-hand column, paragraph 3;<br>figure 3<br>---  | 3, 4                  |
| A  | US 2 216 853 A (MIDDLETON WILLIAM V)<br>8 October 1940 (1940-10-08)<br>page 2, right-hand column, line 63 -page<br>3, left-hand column, line 2<br>figures 10,11<br>--- | 9                     |
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Form PCT/ISA/210 (continuation of second sheet) (July 1992)



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International Application No

PCT/GB 02/00788

| Patent document<br>cited in search report |   | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
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| US 3142488                                | A | 28-07-1964          | NONE                       |                     |
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| US 2216853                                | A | 08-10-1940          | NONE                       |                     |
| US 1850174                                | A | 22-03-1932          | NONE                       |                     |

Form PCT/SA/210 (patent family annex) (July 1992)